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**DoD SUPPLEMENT TO  
TECHNICAL INSTRUCTION BOOK – VOLUME I  
ENHANCED TERMINAL VOICE SWITCH (ETVS)**



**Prepared For:  
DEPARTMENT OF DEFENSE**

Prepared By:  
**Litton Denro**  
9318 Gaither Road  
Gaithersburg, MD 20877  
(301) 840-1597

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**Litton Denro**  
9318 Gaither Road  
Gaithersburg, MD 20877

Phone: 301-840-1597  
Facsimile: 301-869-3192  
Customer Service: 800-952-2502  
301-869-1628

Web address: <http://www.DENRO.com>  
Email address: [DENRO@DENRO.com](mailto:DENRO@DENRO.com)

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## TABLE OF CONTENTS

Paragraph	Title	Page
	INTRODUCTION .....	1
	PROCEDURES .....	2
6.3.1	Battery Test .....	3
6.3.1.1	Equipment .....	3
6.3.1.2	Battery Test – Part 1 .....	3
6.3.1.3	Battery Test – Part 2 .....	6
6.3.1.4	Battery Test – Part 3 .....	8
6.3.3.2	Power Supply Redundancy Test.....	13
6.3.3.3	Low Voltage Disconnect (LVD) Panels .....	15
6.5.13	Replacing Telephone Line Surge Protectors.....	17
6.5.14	Replacing Remote Position Interface Unit (RPIU).....	21
6.5.14.1	Central Rack Location .....	21
6.5.6	Replacing the Back-up (Reserve) Power Supply Batteries (Central Equipment Rack and Full Height Remote Power Rack).....	24
6.5.7	Replacing System Alarm Panels (Central Equipment and Height Remote Power Racks .....	29
6.5.8.1	Identify and Replace Gateway .....	31

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## INTRODUCTION

This Supplement is intended for the use of all DoD ETVS installations and maintenance personnel who are required to make use of DoD-mandated safety procedures and protective safety equipment in performing certain procedures contained in the ETVS Technical Instruction Book. The procedures provided in this Supplement have the same paragraph numbers and headings as the equivalent procedures currently existing in the FAA ETVS Technical Instruction Book, Volume I; these procedures differ from their counterparts in the FAA TIB in that they have been modified with the addition of new cautionary notes, listing of special required safety equipment, and new procedural steps (or modifications to existing steps) where safety procedural considerations and use of safety equipment are required by DoD.

The pages in this Supplement are punched for insertion and use in standard, three-ring binders or, if desired, for substitution in lieu of the existing procedures in the FAA TIB. You will note that the procedures provided herein (with two exceptions) are complete, standalone, self-contained procedures, with each starting at the top of a new page.

The Table of Contents lists each procedure under its exact FAA TIB paragraph number and paragraph title (i.e., heading). For your convenience in locating procedures in this Supplement, single and double digit page numbers are provided as indicated, in sequential order (i.e., 1, 2, 3, 4, ...33) and do not correspond to the Section 6 page numbers in the FAA TIB.

## PROCEDURES

This Supplement contains the following procedures (tests, performance checks, removal/replacements):

### Tests and Performance Checks

- Battery Tests – Parts 1, 2, and 3 (fault isolation)
- Power Supply Redundancy Test
- Low Voltage Disconnect (LVD) Panels (Operational Status Check)

### Removal and Replacement

- Telephone Line Surge Protectors
- Remote Position Interface Unit (RPIU)
- Backup (Reserve) Power Supply Batteries (Central and Remote Racks)
- System Alarm Panels
- Gateway PCs

## **6.3.1 Battery Test**

### **6.3.1.1 Equipment**

Required equipment:

- DC Voltmeter with clip-on lead ends
- Allen wrench, insulated (or Phillips screwdriver, insulated, short length)
- Droplight or flashlight
- Insulated battery caps (DENRO provided)
- Eye protection – safety glasses with sides or face shield
- Leather work gloves
- Stopwatch or wristwatch, as available

### **6.3.1.2 Battery Test – Part 1**

This battery terminal voltage check should be conducted on the system once every six months to determine if any system batteries need to be replaced. The battery test procedure is the same for both central racks and the remote power rack. The battery removal/installation procedure for the full height remote power rack is also the same as that for the central rack. Some ETVS systems do not use the remote power rack.

The ETVS has four basic system configurations designated BS 1 through BS 4. The number of batteries supplying reserve power for the system and their locations depend on the size of the particular system being serviced. For example, a typical BS 3 system has three pairs of batteries (for a total of six) in the Central Equipment Rack, plus one pair of batteries in the Remote 4-position Power Rack Assembly (if present). ETVS systems may have as few as two batteries, or as many as twenty or more depending on how they are configured. The battery locations also vary between system configurations. Each battery compartment will contain either one pair or two pairs of batteries, depending on the system. Access may be more readily obtained from the front of the rack in some systems, while in other systems, batteries may be more accessible through the rear access door.

### WARNING

This procedure requires work on charged (high-current) storage batteries. Portions of the procedure require portions of the equipment to be energized. Potential exists for a flash and uncontrolled high-current flow if battery terminals, cables, or tools are allowed to short. Failure to follow procedures may result in damage to the equipment and injury to the technician.

1. Two qualified technicians, or one qualified technician and a qualified safety observer, must perform the following procedures. All necessary protective equipment and special tools will be available and used.

### WARNING

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

2. Determine the exact location(s) of the batteries to be tested, then gain access to the batteries in the compartment(s) at bottom of the applicable rack assemblies. If access must be from the front of the rack, a louvered panel at the bottom of the rack and a blank panel just above it must be removed (via the removal of four screws in each panel).

Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 3.

### NOTE

If any battery cable is suspected to be defective, the services of Second Level (Depot) Support will be required to replace cable(s).



### WARNING

Use extreme caution when tightening any loose connections. Do not allow the wrench to touch other battery terminals or any other energized metal.

3. Using the droplight if needed, visually inspect all battery cables, connections, and terminals. Tighten any loose connections. Check battery cables for damage, deterioration, cracks, and frayed insulation. If determined that a cable needs replacing, request Second Level (Depot) Support to remove and replace.
4. Turn off the power supplies.

### CAUTION

If the Low Power alarm activates (Low Power LED turns red) any time during the test, restore power to the system immediately and proceed to Part 2 of the Battery Test Procedure.

5. Start timing step 6, using either stopwatch or wristwatch.

### NOTE

Step 6 must be completed within 15 minutes.

6. Using the voltmeter (e.g., Fluke 77 digital VOM or equivalent), measure and record the voltage across the terminals of each battery
7. When step 6 is complete, stop the stopwatch (if using) or record elapsed time if using wristwatch.
8. Turn on power supplies.
9. Compare the recorded terminal voltages of two series-connected batteries. If the difference in voltages is greater than 1.5V, one of the battery pair is considered to have failed. Proceed to paragraph 6.3.1.4, Battery Test – Part 3 (Fault Isolation). Repeat the process for each series-connected pair.
10. Replace any panels removed in step 1.

### 6.3.1.3 Battery Test-Part 2

#### NOTE

Part 1 of the battery test is performed while the batteries are under system load. Part 2 is to be performed if the Low Power alarm activates within 15 minutes after turning off the power supplies.

1. Two qualified technicians, or one qualified technician and a qualified safety observer, must perform the following procedures. All necessary protective equipment and special tools will be available and used.

#### WARNING

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

2. Determine the exact location(s) of the batteries to be tested, then gain access to the batteries in the compartment(s) at bottom of the applicable rack assemblies. If access must be from the front of the rack, a louvered panel at the bottom of the rack and a blank panel just above it must be removed (via the removal of four screws in each panel).

Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 3.

#### NOTE

If any battery cable is suspected to be defective, the services of Second Level (Depot) Support will be required to replace cable(s).

#### WARNING

Use extreme caution when tightening any loose connections. Do not allow the wrench to touch other battery terminals or any other energized metal.

3. Ensure power supplies are on before proceeding with the following steps.
4. Using the droplight if needed, visually inspect all battery cables, connections, and terminals. Tighten any loose connections. Check battery cables for damage, deterioration, cracks, and frayed insulation. If determined that a cable needs replacing, request Second Level (Depot) Support to remove and replace.
5. Using the voltmeter (i.e., Fluke 77 digital VOM or equivalent), measure the battery terminal voltage for each battery. Compare the voltage measurements for each series-connected pair. If the difference in voltages is greater than 2V, one of the battery pair is considered to have failed. Proceed to paragraph 6.3.1.4, Battery Test – Part 3 (Fault Isolation). Repeat the process for each series-connected pair.
6. Replace any front panels previously removed. Maintenance check completed.

#### 6.3.1.4 Battery Test-Part 3 (Fault Isolation)

This part of the battery test contains fault isolation procedures. Perform these procedures if any suspect batteries are found in Parts 1 or 2. Although the system software can report if the reserve power batteries have failed, it cannot specifically pinpoint which battery or batteries have failed. Checks must be conducted on all batteries to fully isolate the failed units.

Required equipment:

- DC Voltmeter with clip-on lead ends
- 5/32" Allen wrench, insulated (or Phillips screwdriver, insulated, short length)
- Droplight or flashlight
- Insulated battery caps (DENRO provided)
- Eye protection – safety glasses with sides or face shield
- Leather work gloves

#### WARNING

This procedure requires work on charged (high-current) storage batteries. Portions of the procedure require portions of the equipment to be energized. Potential exists for a flash and uncontrolled high-current flow if battery terminals, cables, or tools are allowed to short. Failure to follow procedures may result in damage to the equipment and injury to the technician.

1. Two qualified technicians, or one qualified technician and a qualified safety observer, must perform the following procedures. All necessary protective equipment and special tools will be available and used.

#### WARNING

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

- Locate the cabinet in which the Battery LVD resides. Remove the louvered 8.75" x 19" panel on the front, bottom of the rack assembly by removing the four 10-32 x ½ machine screws and four 10-32 retainer plate nuts securing the panel to the rack assembly. The back side of the Battery LVD will now be visible and accessible.
2. While viewing the LVD through the opening in the rack created in the previous step, locate the 800 amp copper relay with the cables attached. Connect the clips on the voltmeter leads (so they stay connected by themselves) between the LVD 800 amp relay input terminal (cable coming from battery + terminal) and the LVD relay output terminal (meter (+)) (cable going from the Battery LVD to the system power bus).

#### NOTE

If the clip-ons are not large enough to attach to the copper plate of the relay, pull back the rubber boot from a cable on each side of the copper plate and attach the appropriate clips to the bolts securing the cables to the plate.

- The voltmeter will read zero volts DC indicating the relay contacts are closed.
3. Go to the central equipment rack(s) containing the Battery Low Voltage Disconnect (LVD). Open the rack assembly rear door.

#### NOTE

The battery low voltage disconnect unit front panel should have the label "Battery Connect" affixed to it. If not, contact DENRO for a label. See **Figure 5-61** for location of label.

4. Remove the +24 VDC power fuse (labeled "Fuse 1 AMP") from front panel of the Battery LVD assembly. This isolates the batteries by removing the +24 VDC battery control voltage between the positive (+) battery terminal and the LVD assembly.

### NOTE

When the fuse is removed, the LOAD CONNECTED LED goes out and the LVD panel contactor opens causing a “clunking” sound. On the SCT, the Power Supply Module Down (24V red icon) appears on the status line of the Main Selection menu.

5. The reading on the voltmeter should indicate approximately +0.25 VDC or more confirming the LVD relay has opened. This is the difference between the battery terminal voltage and the power supply charging voltage.
6. Tag the LVD fuse holder to meet lock out/tag out requirements of AFOSHSTD 91-50 with a sign “Danger-Do Not Energize-Work In Progress on Equipment”.
7. Unbuckle the 42-inch hold-down straps securing the batteries identified earlier.

### WARNING

For your safety and the equipment’s protection, use the protective insulated caps provided for this purpose as instructed in step 9. These insulated caps are stored in a bag located inside the rack cabinet.

8. Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 9.

### NOTE

A screwdriver may be needed in some installations instead of the Allen wrench listed in the proceeding paragraph due to configuration differences.

Tag and label each cable as it is removed in the following step.

### WARNING

Use extreme caution when performing step 9. The Allen wrench can conduct electricity. Do not allow the wrench to touch other battery terminals or any other metal while disconnecting the battery cables.

9. Using the 5/32" Allen wrench, disconnect the battery cables in the following order, noting the cable connections for reinstallation purposes:
  - a) Disconnect all cables attached to the negative (-) terminals of the batteries. Protective caps are not required here.
  - b) Disconnect all positive (+) cables and install a protective cap on each metal lug upon removal from the battery.
  - c) Disconnect the cable linking the two batteries of just the affected battery pair: negative (-) terminal of one battery to the positive (+) terminal of the adjacent battery. Protective caps are not required here.
10. With the batteries completely isolated, measure the battery terminal voltage for each battery identified earlier. The voltage reading should be no less than 10 VDC. If the voltage is less than this minimum acceptable reading, the battery is considered defective and must be replaced. Continue this process until all batteries have been checked.

### CAUTION

Batteries weigh approximately 40 pounds each. Use of carrying straps is recommended if they are being carried individually to and from the equipment area. If moving several batteries (in their cartons) at the same time, use of a hand truck is recommended. Handle batteries with care when installing within the close confines of the equipment rack.

### NOTE

Ensure any replacement battery is fully charged and in good operating condition before using.

11. Replace a defective battery with a fully-charged battery known to be in good operating condition. Any replacement battery should be checked before installing.

#### NOTE

Remove the protective caps and place them back in the storage bag in the cabinet.

12. With the new battery in place, reconnect the cables to the terminals and secure the hold-down strap(s). Following the labels made in step 9, reconnect the cable linking the other battery in the pair, then remove the protective cap(s) and install the system battery cable. Replace all the front panels removed in the proceeding paragraphs.
13. Insure that all personnel are clear of the equipment, all cables, connectors, and covers are in their proper position, and all tools are accounted for. Remove the warning sign on the LVD.
14. At the LVD unit, install the fuse previously removed and close the rack door. The Device Status indicator should indicate that the batteries are on-line after a short period. Ensure that all open rack rear doors have been closed.
15. Check error messages and battery status bar indicators (icons on the Main Selection Menu) at the SCT/MCT for current reserve power battery status. These should indicate that the batteries are charging.

#### NOTE

A battery check should also be performed for the remote power rack. Except for the number of batteries involved and their physical location, the procedure is the same as that for the batteries at the central rack.



### 6.3.3.2 Power Supply Redundancy Test

Required equipment:

- DC Voltmeter with clip-on lead ends
- Droplight or flashlight
- Eye protection – safety glasses with sides or face shield
- Leather work gloves

#### WARNING

This procedure requires work on charged (high-current) electrical busses. This procedure requires the equipment to be energized. Potential exists for a flash and uncontrolled high-current flow if battery terminals, cables, or tools are allowed to short. Failure to follow procedures may result in damage to the equipment and injury to the technician.

1. Two qualified technicians, or one qualified technician and a qualified safety observer, must perform the following procedures. All necessary protective equipment and special tools will be available and used.

Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 2.

#### WARNING

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

2. Open the rear cabinet door of the rack containing the power supplies.
3. Locate the DC power bus bars inside the rack. Connect the voltmeter leads to the positive (+) and negative (-) terminals of the bus.
4. Verify that the system voltage is  $27.5V \pm 10\%$  (24.75–30.25 VDC).
5. Turn off the power switch on power supply #1. The System fault LED should turn Red and the audible alarm should sound at the SAP and the SCT/MCT.

Press the alarm-reset button on the SAP to stop audible alarm. The Main Power fault LED at the SAP and the Main Power icon on the SCT/MCT monitor should remain Green. (All systems are designed with an n+1 power supply redundancy. The loss of two modules is required before a main power fault will be indicated.)

#### NOTE

BS-4 sized system power supplies are numbered starting with the bottom, left power supply as number one moving left to right for units two and three. Unit 4 is on the second row up, top left.

BS-1 through BS-3 sized systems do not have a second (top row) and are numbered one through three left to right.

6. Check that the system voltage is still  $27.5V \pm 10\%$  (24.75–30.25 VDC). Verify that the front panel FAULT LED is Off (i.e., not Amber) for all remaining power supplies.
7. Turn on the power supply and, if there are no other system faults, wait for the system fault to clear (i.e., System fault LED turns Green).
8. Repeat steps 4 through 7 for the remaining power supplies.

### 6.3.3.3 Low Voltage Disconnect (LVD) Panels

In case of an LVD failure or malfunction, maintenance action should be to contact Second Level Support for assistance.

Both the central rack and the remote power rack have LVD panels. In the central rack, there are two versions of this panel: battery connect LVD and delayed start load (load connect) LVD. The remote rack has a battery LVD only. Except for certain specific system (circuit) functions, wiring connections, and the Low Voltage DC Sensing PC Board, the LVD panels are identical. The battery LVD is connected in the charge path between the central rack/remote rack power supplies and the batteries; the load connect units are used by the ETVS power distribution system to connect the central rack power supplies and the reserve power battery supply. This performance check applies to both LVD versions.

For this procedure, the unit must be on-line (AC power on) with the front panel NORMAL/MANUAL OVERRIDE mode selector switch in the NORMAL position and the LOAD CONNECTED lamp illuminated Green. During normal operation, if the battery voltage should drop below a preset value for more than 8–10 seconds, the LOAD CONNECTED lamp should go out; the relay on the Low-Voltage DC Sensing PC Board transfers its contacts. This de-energizes (opens) a contactor disconnecting the load from the battery voltage and extinguishing the LED. Once the battery voltage level reaches a preset value for connect (pickup) voltage, the delayed connect panels connect the system load to the power supply/battery output (and LOAD CONNECTED LED illuminates).

Required equipment:

- Droplight or flashlight
- Eye protection – safety glasses with sides or face shield
- Leather work gloves

To check the operational status of an LVD panel, proceed as follows:

#### **WARNING**

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before beginning this procedure.

1. Open rear door to gain access to panels.
2. With the NORMAL/MANUAL OVERRIDE mode selector still in its NORMAL position, remove Fuse F1 (labeled “Fuse 1 AMP”) from front panel.
3. Observe that the LOAD CONNECTED LED extinguishes and the contactor opens (should hear a “clunking” sound). Also, the system fuse alarm sounds.
4. Place NORMAL/MANUAL OVERRIDE selector switch to MANUAL OVERRIDE; the LOAD CONNECTED LED should illuminate, and the contactor should close (a “clunking” sound should be heard). If it does not, the LVD unit has internal circuit problem, and must be replaced. Contact Second Level maintenance support personnel for this maintenance service.
5. Switch selector back to NORMAL position, observing that the LOAD CONNECTED LED again goes out, and the contactor opens (a “clunking” sound should be heard).
6. Replace panel fuse F1. Observe that LOAD CONNECTED LED illuminates and that the contacts close.

#### NOTE

If the LOAD CONNECTED LED fails to illuminate/extinguish at the specified times during the procedural steps, contact Second Level (Depot) Support for assistance.

7. Upon completion of the procedures, close rear door.
8. In turn, check all LVD units.

### **6.5.13 Replacing Telephone Line Surge Protectors**

Required equipment:

- Droplight or flashlight
- Eye protection – safety glasses with sides or face shield
- Leather work gloves

#### **WARNING**

This procedure requires work in confined areas with high-current storage batteries. Potential exists for a flash and uncontrolled high-current flow if battery terminals, cables, or tools are allowed to short. Failure to follow procedures may result in damage to the equipment and injury to the technician.

1. Two qualified technicians, or one qualified technician and a qualified safety observer, must perform the following procedures. All necessary protective equipment and special tools will be available and used.

#### **WARNING**

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

2. Determine the exact location(s) of the surge protectors to be tested or replaced. If access must be from the front of the rack, a louvered panel at the bottom of the rack or a blank panel just above it may need to be removed (via the removal of four screws in each panel).

Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 3.

### WARNING

Use extreme caution when tightening or loosening any connections. Do not allow any tools to touch the battery terminals or any other energized metal.

3. Open the rack assembly rear door.
4. Using the droplight to illuminate the work area, locate the surge protector to be removed.

### NOTE

If the green ground wire is not clearly visible and accessible from the rear of rack, the unit may have to be accessed from front of rack by removing one or more panels, depending on the system's configuration.

5. Disconnect the 5-inch ground wire with green insulation (3/8" wire with a Faston style terminal) from the Faston terminal end. This wire is attached to the rear of the protector and runs to a Faston type terminal located on the rear top of the housing that holds the surge protectors in place.
6. Remove the Velcro strip on the demarc cable connected to the front of the transient surge protector.
7. **Ensure that the surge protector to be disconnected is the correct one. When the demarc cable is disconnected next, up to twenty-five pairs of the telephone cable will be disconnected and may interrupt up to fifteen ETVS telephone circuits.** Disconnect the demarc cable on the front of the transient surge protector.

### WARNING

Steps 10 and 11 may have to be accomplished (removing the retaining screws for the cards and removing the card from the card cage) before steps 8 and 9 (disconnecting the rear cables) if the rear of the protector cannot be accessed. If so, use extreme caution when pulling out the protector since the cable is still attached to the back of it. Pull it out just enough to accomplish step 5.

8. Release the two retentive clips holding the cable in place in the rear of the surge protector.
9. Disconnect the cable in the rear of the transient surge protector. This cable connects to the telephone card cages.
10. Unfasten the two retentive captive screws securing the transient surge protector to the surge protector card cage.
11. Pull the transient surge protector out of its slot in the card cage.
12. Using procedures of paragraphs 6.4.9, check the condition of each transient surge protector.

### NOTE

If any defective components (fuses) are located on a transient surge protector, replace the protector with a new transient protector. Site maintenance personnel should not replace the fuses.

13. Reinstall the transient surge protector. Secure the card in its card cage with the captive screws.
14. Connect the cable coming from the card cages to the rear of the protector and secure it in place with the clips.
15. Connect the demarc cable and reinstall the Velcro strip to secure it in place.
16. Reconnect the green ground wire at the Faston connector.
17. If needed, repeat steps 2 through 14 until all transient surge protectors in the rack have been inspected.
18. Close the rack door. Insure that all personnel are clear of the equipment, all cables, connectors and covers are in their proper position, and all tools are accounted for.

### **6.5.14 Replacing Remote Position Interface Unit (RPIU)**

Replacement of an RPIU will shut down the position with which it is associated; therefore, this maintenance activity must be coordinated with ATC. Four functional versions of this unit are installed in the system:

RPIU—Local, Non-Split Position, P/N 110956-003

RPIU—Remote, Non-Split Position, P/N 110956-004

RPIU—Local, Split Position, P/N 110956-001

RPIU—Remote, Split Position, P/N 110956-002

Exact locations vary from system to system. In the central equipment rack, the units are installed on a shelf at the bottom of one of the rack assemblies (e.g., radio); quantities required also vary. At remote locations, these units are located within their associated position consoles. Unit design ensures that the units are installed in the correct direction at either end by using male/female connector matching.

In the central rack, the units are positioned and held in place on a rack-mounting bracket by a hold-down bracket and 6-32 x 5/16 panhead screws. The mounting arrangement at the equipment positions depends upon the physical design of the government-furnished consoles.

Removal/replacement procedures for the RPIU are provided as follows in paragraphs 6.5.14.1 and 6.5.14.2.

#### **6.5.14.1 Central Rack Location**

##### **NOTE**

Location of RPIU may vary from site to site, depending on ETVS Basic System Configuration (BS-1, -2, -3, or -4) used at the site. If your RPIUs are located in front/bottom of rack versus rear/bottom of rack (as in some systems), it may be necessary to remove a front louvered panel.



### WARNING

Use a droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

Wear safety eye protection (for protection from sparks given off if an arc occurs) before beginning this procedure.

1. Open the rear door of the rack assembly.
2. Loosen and remove the 6-32 x 5/16 panhead screws securing the RPIU hold-down bracket and remove the bracket.

### NOTE

The following step will shut down the position associated with this RPIU. This maintenance activity must be coordinated with the ATC.

### CAUTION

To avoid blowing an internal position fuse (e.g., IBOP) when the position cable is being removed, power must be shut off to the position before unplugging the RPIU cables. The male connector has DC power present on pins.

3. Remove the fuse for the position being serviced at the position fuse panel.
4. Unplug the cables at the following receptacles on the RPIU and disconnect the ground cable to chassis at the E1 stud:
  - J1, Central Rack (ISDN-S/Power)
  - J2, ISDN-U Link Cable
  - J3, +24V Auxiliary Power
  - J4, Position Equipment (ISDN-S)
5. Have the replacement unit(s) available and ready to be installed.
6. Install the replacement unit(s), reconnect the cables, secure the hold-down bracket on units, and close the door at rear of the rack assembly.

7. Replace the fuse in the position fuse panel.
8. If necessary, perform RPIU alignment; see procedure 6.6.5.11.
9. Run the position confidence performance test (section 3.3) to assure the equipment is operating properly and then place the position back on-line.

### **6.5.6 Replacing the Back-up (Reserve) Power Supply Batteries (Central Equipment Rack and Full Height Remote Power Rack)**

Required equipment:

- DC Voltmeter with clip-on lead ends
- 5/32" Allen wrench, insulated
- Phillips screwdriver, insulated, "stubby" length (1-inch blade)
- Droplight or flashlight
- Insulated battery caps (DENRO provided)
- Eye protection – safety glasses with sides or face shield
- Leather work gloves

#### **NOTE**

Depending on the ETVS BS configuration involved, the numbers and locations of batteries will vary. For the purposes of this procedure, a typical BS 3 configuration will be used.

#### **WARNING**

This procedure requires work on charged (high-current) storage batteries. Portions of the procedure require the equipment to be energized. Potential exists for a flash and uncontrolled high-current flow if battery terminals, cables, or tools are allowed to short. Failure to follow procedures may result in damage to the equipment and injury to the technician.

1. Two qualified technicians, or one qualified technician and a qualified safety observer, must perform the following procedures. All necessary protective equipment and special tools will be available and used.

### WARNING

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

2. Connect voltmeter between the Low Voltage Disconnect (LVD) contactor input terminal (meter (-)) (cable coming from battery + terminal) and the LVD contactor output terminal (meter (+)) (cable from the LVD-Delayed connect/power supply). Indication on the meter will be a reading of zero VDC indicating the relay contacts are closed. (Use clip-on type meter leads so they stay connected).
3. Go to the Central Equipment Rack (or Remote Power Rack, as appropriate) containing the Battery LVD Unit. Open the rear door of the rack to gain access to the LVD.

Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 3.

### CAUTION

The ETVS will have no back-up power with the +24 VDC fuse (labeled "Fuse 1 Amp") removed. Any loss of AC power will result in the immediate shut down of the system.

### NOTE

When the fuse is removed below, the LOAD CONNECTED LED goes out and the LVD panel contactor opens (should hear a "clunking" sound). On SCT, Power Supply Module Down (24V red icon) appears on status line of Main Selection menu.

4. On the Battery LVD unit only, remove the front panel +24 VDC fuse (labeled "Fuse 1 AMP") from the LVD front panel (labeled "Battery Connect" on LVD front panel). This isolates the batteries contained in the Power/Operator and/or Maintenance Rack Assemblies, removing the +24 VDC battery control voltage between the positive (+) battery terminal and the LVD.

5. The reading on voltmeter should indicate approximately 2 VDC or more (difference between the battery terminal voltage and the power supply charging voltage) confirming the LVD contactor has opened.
6. Tag the LVD fuse holder to meet lock out/tag out requirements of AFOSHSTD 91-50 with a sign "Danger-Do Not Energize-Work In Progress on Equipment".
7. On the front of either or both racks, remove the louvered (8.75" x 19") panel at the bottom of the rack assembly by removing the four 10-32 x ½ machine screws and four 10-32 retainer plate nuts securing the panel to the rack assembly.

### NOTE

In the BS 3 configuration, permanently mounted battery shelves are located at the bottom of the rack assemblies. This is a typical arrangement for the ETVS system. The Basic System BS X designator determines the exact number of batteries (battery pairs) to be used and the corresponding number of racks containing the batteries.

### WARNING

Use extreme caution when performing steps 8 and 9. The wrench used can conduct electricity. Do not allow the wrench to touch other battery terminals or any other metal while disconnecting the battery cables.

8. Using the droplight to illuminate the work area, unbuckle the 42" battery tie-down strap securing the batteries (one strap per battery pair).

### WARNING

For your safety and to protect equipment, use the protective insulated caps provided for this purpose as instructed in step 10. These insulated caps are stored in a bag located inside the rack cabinet.

9. Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 10.
10. Using the 5/32" Allen wrench, disconnect the battery cables in the following order, noting the cable connections for reinstallation purposes:
  - a) Negative (-) cable-to-rack power bus. Disconnect all cables; protective caps not required.
  - b) Positive (+) cable-to-rack power bus. Disconnect all cables; install protective caps.
  - c) Cable linking the two batteries of just the affected battery pair: negative (-) terminal of one battery to the positive (+) terminal of the adjacent battery.

### CAUTION

Batteries weigh about 40 pounds each. Use of carrying straps is recommended if they are being carried/removed from their cartons individually to and from the equipment area and the storage area is located some distance away. If moving several batteries in their cartons at the same time, use of a hand truck is recommended. Handle batteries with care when removing and installing them in the close confines of the equipment rack.

11. Lift battery (-ies) from the battery shelf at the bottom of the equipment rack via the rear door opening, to be replaced one at a time, as needed.

### NOTE

Before installing any replacement battery, ensure that it has been fully charged. During replacement of the batteries, there will be no battery charger in use at the rack assembly.

12. To install the replacement battery (-ies), place it on the shelf in position to be hooked up to battery cables. Reconnect all battery cables (that is, those of the affected battery pair—batteries are installed in pairs and only one pair can be checked at a time) using the labels made in step 10. Connect the interconnecting cable first, from the positive (+) terminal of one battery to the

- negative (-) terminal of the other, then the cables to the remaining negative (-) and positive (+) terminals of the affected battery pair.
13. Secure (rebuckle) the battery hold-down strap(s). Place protective caps back in storage bag.
  14. Secure the louvered panel. Insure that all personnel are clear of the equipment, that all cables, connectors, and covers are in their proper position, and that all tools are accounted for. Remove the warning sign on the LVD.
  15. At LVD unit, install the fuse that was previously removed and close the rear rack door. The Device Status indicator should, after a short elapsed interval, indicate that the batteries are on-line. Ensure that all open rack rear doors have been closed.
  16. Check error messages and battery status bar indicators (icons on Main Selection Menu) at the SCT/MCT for current reserve power battery status. These should indicate that batteries are charging.

### **6.5.7 Replacing System Alarm Panels (Central Equipment and Full Height Remote Power Racks)**

Required equipment:

- Phillips screwdriver
- Droplight or flashlight
- Eye protection – safety glasses with sides or face shield

#### **NOTE**

The main system alarm panel is located directly above the maintenance position equipment in the maintenance rack of the Central Equipment Rack; the other alarm panel is located at the remote position power rack.

#### **WARNING**

Use a droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

Wear safety eye protection (for protection from sparks given off if an arc occurs) before beginning this procedure.

1. Remove power to the panel by removing the appropriate fuse from the position fuse panel. Labeling of the fuse depends on the ETVS system configuration.
2. Unscrew the four panel mounting screws securing the unit on the central rack. (At the remote rack, two screws secure the remote alarm panel.)

#### **WARNING**

Use caution when removing the panel. Cabling may not allow the panel to be moved very far, and damage to the cables or connectors could result.

3. Pull unit out from the rack assembly.
4. Identify, tag, and disconnect cables.



5. Remove unit from the rack.
6. To install, connect cables to the replacement unit and push the unit back into the rack.
7. Secure the panel with the mounting screws.
8. Reinstall fuse in position fuse panel for the SAP to reapply power.
9. To check for the audible alarm, press the front panel ALARM RESET/TEST switch. If working properly, the audible alarm will sound briefly.

### 6.5.8.1 Identify and Replace Gateway

Required equipment:

- Phillips screwdriver, insulated, short length
- Droplight or flashlight
- Eye protection – safety glasses with sides or face shield
- Leather work gloves

First, determine which Gateway is being replaced (GATEWAY-A or GATEWAY-B) by looking at the active Gateway name on an SCT (if the existing Gateway name is GATEWAY-A, then the name of the Gateway to be replaced will be GATEWAY-B). If a Gateway computer is not operating, start with the non-operational unit first. If the replacement is for an upgrade, start with the inactive one first.

#### NOTE

The operational status of the Gateway computers is available at the SCT/MCT, which provides information as to which computer is down from the icons at the bottom of the screen.

A SPARE Gateway PC cardfile will be expected to have DOS, Windows, the Gateway executable code, and NISR code preinstalled. These can be seen using File Manager as shown in section 6.5.8.3, step 1, after installation. If these prerequisites are not on the hard disk, return the unit to DENRO. This Gateway replacement should not have been in the SPARE locker.

1. Bring the replacement Gateway Computer to the work area.
2. Verify that the affected Gateway Computer may be taken off-line. This information comes from the Supervisor.
3. Turn off the power switch on the front of the Gateway Computer that is being replaced.
4. Pull the associated Gateway Interface card out of the main rack. Gateway Interface A is always on the left and Gateway Interface B is always on the right.

### CAUTION

Be especially careful to keep the T connectors and the Ethernet cables from touching each other when disconnecting cables.

### WARNING

Use the droplight or flashlight to illuminate the intended work area. Do not place your hands blindly inside the rack. Ensure that the object being handled can be seen.

Wear safety eye protection (for protection from sparks given off if an arc occurs) and leather work gloves (for protection of hands from hitting objects) before starting step 5.

5. On the rear of the Gateway computer, disconnect the power cable attached to rear of the unit (at P1 connector), the Ethernet cables, and the Gateway Interface cable. (For rear panel connector locations, see **Figure 5-51**.) Identify, tag, and disconnect all cables connected to the unit.
6. To remove the defective unit from its rack adapter:
  - a) Release the two captive retaining screws at the bottom of the front panel.
  - b) Using the handle, slide defective unit out of rack assembly.

### WARNING

When installing the 24 VDC Gateway PC, do not plug the power cord into an AC wall socket. This unit's cord plug is similar to a standard AC cord, but the connector is keyed to prevent its connection to a standard AC power cord.

7. Install the replacement unit and fasten all retaining screws. This includes reconnecting all of the cables (including the power cables).

### NOTE

If the plug on the keyboard being used for this procedure does not fit the keyboard connector on the rear of the Gateway unit (**Figure 5-51**) being replaced, use the AT to PS2 adapter (type: 5-Pin DIN to 6-Pin DIN) that should have been provided with your system. If not, this adapter can be procured at a local electronics or computer store.

8. Connect the monitor, keyboard, and mouse to the newly replaced Gateway.
9. Push the Gateway Interface card back into rack.
10. Turn on front panel POWER switch to start the new Gateway Computer.